THE PHYSICS
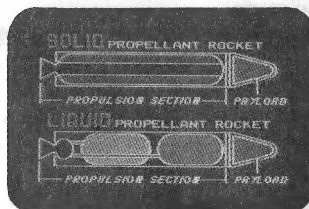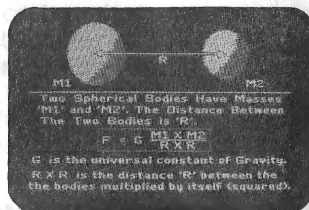## OF
MODEL ROCKETRY

FOR APPLE IIe and IIc COMPUTERS WITH 64K MEMORY. COLOR MONITOR RECOMMENDED.

CONTENTS:
5¼ Inch Disk
User's Guide
90 Day Warranty

PROGRAMS:
Action-Reaction
Inertia
Momentum
Acceleration and Energy
Staging
Satellites
Tech Tip™ on G Forces

These programs help you understand the interactions of mass, forces, and motion involved in the flight of model rockets. Learn Newton's Laws of Motion. Understand the concepts of acceleration, gravity, momentum, inertia, and staging. Learn the parts of a rocket and a rocket motor and the function of each part. Understand the similarities between full-scale rockets like the Saturn V and model rockets. Know about satellites, orbits, primaries, and the velocities and periods of satellites.

Clear graphics and easy-to-understand wording help you understand the physics of rocket flight.

You will have frequent opportunities to interact with the computer to test and reenforce your understanding.

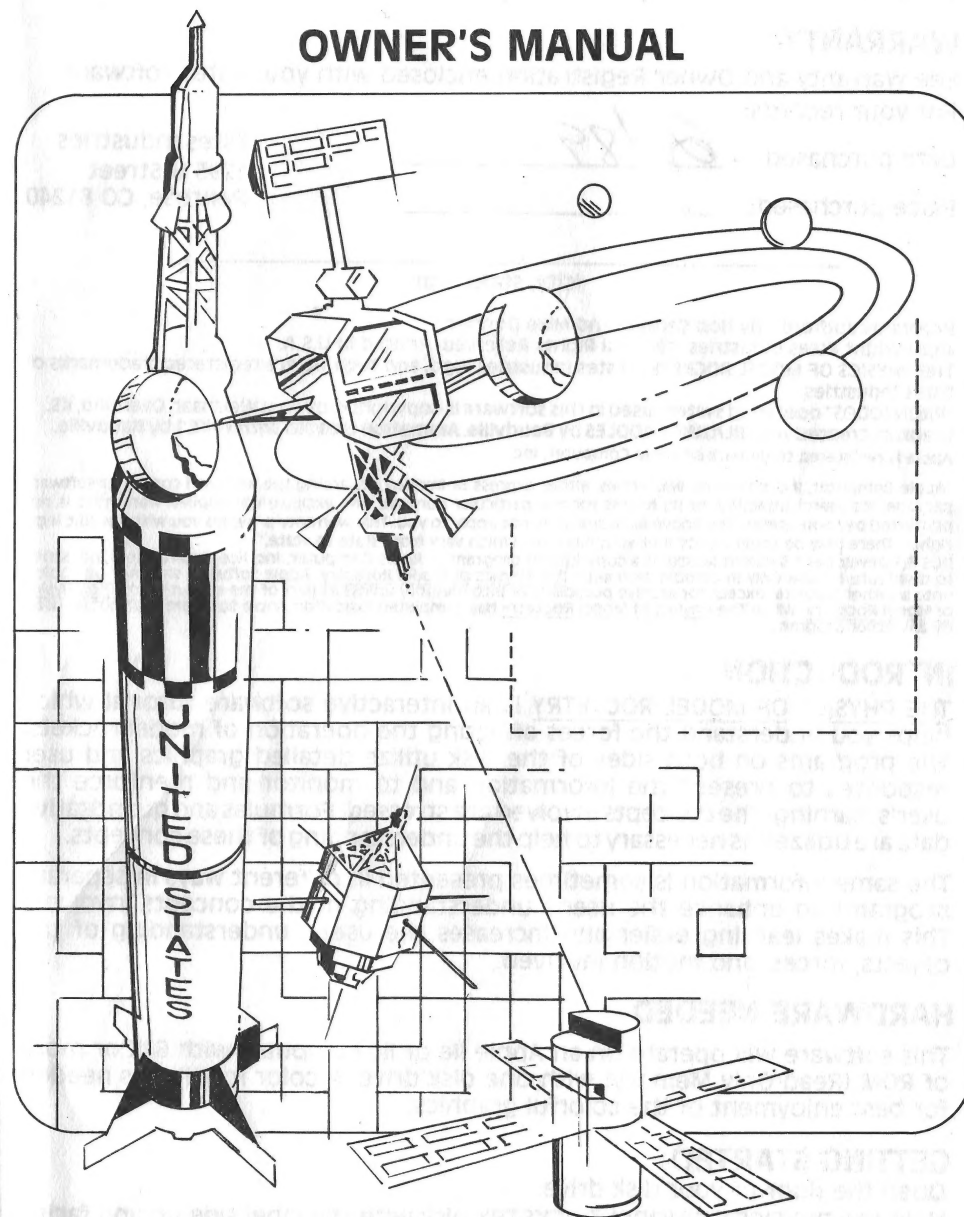Estes Industries
1295 H Street
Penrose, CO 81240
A DAMON COMPANY

No. 9027

84821

32-6918

THE PHYSICS
OF
MODEL ROCKETRY
By Bob Cannon and Mike Dorffler

OWNER'S MANUAL

ESTES
®
A DAMON COMPANY

No. 9027

COPYRIGHT

WARRANTY

See Warranty and Owner Registration enclosed with your Estes software.

For your records:

Date purchased: _2/89_

Place purchased: _____

Estes Industries
1295 H Street
Penrose, CO 81240

_____
(city, state, zip)

INTRODUCTION

THE PHYSICS OF MODEL ROCKETRY is an interactive software tutorial which helps you understand the forces affecting the operation of model rockets. The programs on both sides of the disk utilize detailed graphics and user responses to present the information and to monitor and reenforce the user's learning. The concepts involved are stressed. Formulas and quantitative data are utilized as necessary to help the understanding of these concepts.

The same information is sometimes presented in different ways in separate programs to enhance the user's understanding of the concepts involved. This makes learning easier and increases the user's understanding of the objects, forces, and motion involved.

HARDWARE NEEDED

This software will operate on an Apple IIe or IIc computer with 64K or more of ROM (Read Only Memory) with one disk drive. A color monitor is needed for best enjoyment of the colorful graphics.

GETTING STARTED

Open the door of your disk drive.

Hold the PHYSICS OF MODEL ROCKETRY disk with the label side up and facing you. Carefully place the disk in the disk drive and close the door.

Turn on your computer and monitor.

Follow the instructions on the screen.

Enjoy!

CONTENTS OF DISK

Introduction	Momentum	Satellites
Action-Reaction	Acceleration and Energy	Tech Tip™ -- G Forces
Inertia	Staging	

Each program presents information on its topic. Excellent graphics are featured to aid your understanding. The programs provide interaction to let you review your knowledge of the topic. The program will continue based on your responses to these questions. This tutorial approach reenforces your understanding of the concepts and corrects your understanding whenever necessary. You learn, and you understand.

The programs are designed to be used in the order listed. Each program builds on what has been learned in the previous programs. Enough repetition of information is provided to aid you if you decide to use the programs in other than the order planned.

The emphasis is on understanding and being able to use the information in relation to model rockets, but most of the information can help you in other areas.

SUMMARY OF PROGRAMS

Introduction
This program briefly explains what is covered in each of the other programs. The Menu is included.

Action-Reaction
The parts of a rocket and the functions of each part are presented. The operation of a rocket's motor is explained. The Third Law of Motion--Action-Reaction--is explained.

Inertia
Gravitational attraction, static inertia, kinetic inertia, and reentry of a body into the atmosphere are explained. The First Law of Motion--Inertia--is stated.

Momentum
The concept of mass is explored. Calculating momentum is explained. Some forms of energy and some transformations of energy are discussed. The total impulse of a model rocket engine is explained. Ballistic coefficients during thrusting and during coasting are investigated.

Acceleration and Energy
Both positive and negative acceleration are explained. The effect of gravity upon masses is explored. Drag and the coefficient of drag are investigated. Momentum as well as kinetic and potential energy are covered. The total impulse delivered by a model rocket engine is studied. The importance of specific impulse delivered by a model rocket engine is examined. The importance of specific impulse and what it means are stated. The force equation is presented and examined.

Staging
Balanced and unbalanced forces are investigated. Both positive and negative acceleration are examined. The effect of mass upon acceleration is covered. How and why rockets are staged is explored. Satellites are discussed. The Second Law of Motion--Momentum Change--is explained.

Satellites
Satellites, primaries, and orbits are covered. Elliptical and circular orbits, sub-orbital launches, and escape from Earth are covered. Orbital heights, velocities, and periods are explained. The importance of a geosynchronous orbit is explained.

Tech Tip™ on G Forces
How to calculate G forces and burnout velocities for model rockets is explained.